

CLAIMS:

We claim:

1. An implantable hearing aid transducer mountable to a transducer mounting apparatus, the transducer comprising:

5 an actuator to stimulate an auditory component;

a driver comprising at least one magnet and one coil; and

10 a transducer housing having a rotatable portion housing at least a portion of one of the magnet and the coil of the driver, wherein the rotatable portion of the transducer housing is rotatable relative to a transducer mounting apparatus, and wherein during rotation a center of rotation of the rotatable portion of the transducer housing remains positionally fixed.

2. The transducer of Claim 1 wherein the rotatable portion of the transducer housing is rotatable within a cavity of the transducer mounting apparatus.

15 3. The transducer of Claim 1 wherein the transducer housing includes an aperture extending through at least a first side thereof, and wherein the actuator is advanceable through the aperture to interface with the auditory component.

20 4. The transducer of Claim 3 wherein the rotatable portion of the transducer housing is rotatable to align one of an actuator axis and the aperture with a desired interface point on the auditory component.

25 5. The transducer of Claim 1 wherein the actuator is detachably connectable to the transducer housing along a continuum of vertical positions.

6. The transducer of Claim 1 wherein the rotatable portion of the transducer housing is substantially rounded for rotation relative to the transducer mounting apparatus.

7. The transducer of Claim 1 wherein the rotatable portion of the transducer housing is selectively securable to the mounting apparatus along a continuum of angular orientations.
- 5 8. The transducer of Claim 3 wherein the actuator is a separate structure from the transducer housing that is insertable into and advanceable through the aperture.
9. The transducer of Claim 3 wherein the aperture extends through a second side of the transducer housing.
- 10 10. The transducer of Claim 9 comprising:
a tube movably connected within the aperture and configured to receive the actuator.
- 15 11. The transducer of Claim 1 wherein at least one of the coil and the magnet is hermetically sealed within the transducer housing.
12. The transducer of Claim 1 wherein at least one of the coil and the magnet is connected to the actuator in a hermetically sealed manner.
- 20 13. The transducer of Claim 10 comprising:
a spring washer connecting the tube within the aperture in a movable manner.
- 25 14. The transducer of Claim 10 wherein when the actuator is detachably connectable to the tube and the tube and actuator are movable by the driver relative to the transducer housing.

15. A method for implanting a hearing aid transducer within a patient, the method comprising:

attaching a transducer mounting apparatus to a patient's skull;

using the mounting apparatus, supporting a rotatable portion of a transducer

5 housing, wherein the rotatable portion encloses at least a portion of a transducer driver; and

10 rotating the rotatable portion of the transducer housing relative to the mounting apparatus to orient the transducer for interfacing with an auditory component, wherein during the rotating step, a center of rotation of the rotatable portion remains positionally fixed.

15. The method of Claim 15 wherein the supporting step comprises supporting the rotatable portion within a cavity of the mounting apparatus, and the rotating step comprises rotating the rotatable portion within the cavity to a desired orientation relative to the auditory component.

17. The method of Claim 15 wherein the rotating step comprises:

aligning at least one of an actuator axis and an aperture in the transducer housing with a desired interface point on the auditory component.

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18. The method of Claim 16 the method comprising:

securing the rotatable portion of the transducer housing in the desired orientation relative to the auditory component.

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19. The method of Claim 18 wherein the securing step comprises:

securing the rotatably portion of the transducer housing in the desired orientation in a detachable manner.

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20. The method of Claim 17 the method comprising:
inserting an actuator through the aperture in the transducer housing; and
advancing the actuator through the aperture to interface the actuator with the auditory component.

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21. The method of Claim 20 the method comprising:
interfacing the actuator with the auditory component; and
securing the actuator to the transducer housing.

10 22. A transducer system comprising:
a mounting apparatus attachable to a patient's skull;
a transducer housing having a rotatable portion housing at least a portion of one of the magnet and the coil of the driver, wherein the rotatable portion of the transducer housing is rotatable relative to a transducer mounting apparatus, and wherein during
15 rotation a center of rotation of the rotatable portion of the transducer housing remains positionally fixed; and
a retention apparatus to selectively secure the rotatable portion of the transducer housing relative to the mounting apparatus.

20 23. The transducer system of Claim 22 wherein the rotatable portion of the transducer housing is selectively securable to the mounting apparatus along a continuum of angular orientations.

25 24. The transducer system of Claim 22 wherein the mounting apparatus defines a cavity for receiving the rotatable portion of the transducer housing therein.

25 25. The transducer system of Claim 24 wherein the rotatable portion of the transducer housing is rotatable within the cavity to align one of an aperture in the transducer housing and an actuator axis with a desired interface point on an auditory member.

26. The transducer system of Claim 22 wherein the rotatable portion of the transducer housing is rounded for rotation relative to the mounting apparatus.
27. The transducer system of Claim 22 wherein the retention apparatus is selectively movable between a locked and unlocked position.
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28. The transducer system of Claim 27 wherein the rotatable portion of the transducer housing is rotatable, upon application of a predetermined amount of force, relative to the mounting apparatus, when the retention apparatus is in the locked position.
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29. The transducer system of Claim 27 wherein the retention apparatus comprises:
 - a retaining member;
 - at least one guide on the retaining member movable along a predetermined path
 - 15 of travel in the mounting apparatus between an unlocked and a locked position; and
 - a resilient member compressible between the retaining member and a rotatable member to capture the rotatable member in a desired orientation relative to an auditory component when the retention apparatus is in the locked position.
30. A method for implanting a hearing aid transducer within a patient, the method comprising:
 - 20 angularly orienting the transducer relative to a transducer mounting apparatus using rotational movement of a rotatable portion of a transducer housing; and
 - vertically orienting the transducer using an actuator advanceable relative to the transducer housing; and
 - 25 interfacing the actuator with an auditory component.
31. The method of Claim 30 wherein the angularly orienting step comprises:
 - 30 rotating the rotatable portion of the transducer housing within a cavity of the mounting apparatus.

32. The method of Claim 30 the method comprising:
securing the rotatable portion of the transducer housing within the mounting apparatus in the desired angular orientation.
- 5 33. The method of Claim 32 wherein the vertically orienting step comprises:
inserting an actuator through an aperture in the transducer housing; and
advancing the actuator through the aperture to interface the actuator with the auditory component.
- 10 34. The method of Claim 30 the method comprising:
connecting the actuator to the transducer housing.